Sixth Grade Mathematics

Standard 1: Students will acquire number sense and perform operations with rational numbers.

Objective 1: Represent whole numbers and decimals in a variety of ways.

a. Change *whole numbers* with *exponents* to *standard form* (e.g., $2^4 = 16$) and recognize that $10^0 = 1$.
b. Read and write *numerals* from thousandths to one billion.
c. Write a whole number to 999,999 in *expanded form* using *exponents* (e.g., $876{,}539 = 8 \times 10^5 + 7 \times 10^4 + 6 \times 10^3 + 5 \times 10^2 + 3 \times 10^1 + 9 \times 10^0$).
d. Express numbers in *scientific notation* using positive powers of ten.
e. Classify whole numbers to 100 as *prime*, *composite*, or neither.
f. Determine the *prime factorization* for a whole number up to 50.

Objective 2: Identify relationships among whole numbers, fractions (rational numbers), decimals, and percents.

a. Find the *greatest common factor* and *least common multiple* for two numbers using a variety of methods (e.g., list of multiples, prime factorization).
b. Compare and order *rational numbers*, including mixed fractions, using a variety of methods and symbols.
c. Locate positive rational numbers on a number line.
d. Convert common fractions, decimals, and percents from one form to another (e.g., 3/4= 0.75 = 75%).

Objective 3: Model and illustrate meanings of operations and describe how they relate.

a. Represent division of a multi-digit *dividend* by two-digit *divisors*, including decimals, using models, pictures, and symbols.
b. Model addition, subtraction, multiplication, and division of fractions and decimals in a variety of ways (e.g., objects, a number line).
c. Apply *rules of divisibility*.
d. Select or write a number sentence that can be used to solve a multi-step problem and write a word problem when given a two-step expression or equation.

Objective 4: Use fractions and percents to communicate parts of the whole.

a. Divide regions, sets of objects, and *line segments* into equal parts using a variety of models and illustrations.
b. Name and write a fraction to represent a portion of a unit whole for halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths, and sixteenths.
c. Write a fraction or ratio in simplest form.
d. Name equivalent forms for fractions (halves, thirds, fourths, fifths, tenths), ratios, percents, and decimals, including repeating or terminating decimals.
e. Relate percents less than 1% or greater than 100% to equivalent fractions, decimals, *whole numbers*, and mixed numbers.

Objective 5: Solve problems using the four operations with whole numbers, decimals, and fractions.

a. Determine when it is appropriate to use estimation, mental math strategies, paper and pencil, or a calculator.
b. Use estimation strategies to determine whether results obtained using a calculator are reasonable.
c. Multiply up to a three-digit *factor* by a one- or two-digit factor including decimals.
d. Divide up to a four-digit *dividend* by a one- or two-digit *divisor* including decimals.
e. Add and subtract decimals to the thousandths place (e.g., 34.567+3.45; 65.3-5.987).
f. Add, subtract, multiply, and divide fractions and mixed numbers.
g. Solve problems using ratios and proportions.
h. Simplify *expressions*, with *exponents*, using the *order of operations*.

Objective 6: Model, illustrate, and perform the operations of addition and subtraction of integers.

a. Recognize that the sum of an *integer* and its opposite is zero.
b. Model addition and subtraction of integers using manipulatives and a number line.
c. Add and subtract integers.

Standard 2: Students will use patterns, relations, and functions to represent and analyze mathematical situations using algebraic symbols.

Objective 1: Recognize, analyze, and use multiple representations of patterns and functions and describe their attributes.

a. Analyze patterns on graphs and tables and write a generalization to predict how the patterns will continue.
b. Create tables and graphs to represent given patterns and algebraic *expressions*.
c. Draw a graph from a table of values or to represent an equation.
d. Write an algebraic expression from a table of values.

Objective 2: Represent, solve, and analyze mathematical situations using algebraic symbols.

a. Recognize that a number in front of a variable indicates multiplication (e.g., 3y means 3 times the quantity y).
b. Solve two-step equations involving *whole numbers* and a single variable (e.g., 3x+4=19).
c. Recognize that "≈" indicates a relationship in which the quantities on each side are approximately of equal value (e.g., $\Pi \approx 3.14$).
d. Recognize that an *exponent* can be represented in the following ways: 4^3 or 4^3.
e. Evaluate *expressions* and formulas, substituting given values for the variables (e.g., 2x+4; x=2; therefore, 2(2)+4=8).
f. Recognize that if the *product* is zero, then one or more *factors* equal zero (i.e., if a*b=0 then either a=0 or b=0 or a and b=0).

Standard 3: Students will use spatial and logical reasoning to recognize, describe, and identify geometric shapes and principles.

Objective 1: Identify and analyze characteristics and properties of geometric shapes.

a. Identify the *midpoint* of a line *segment*.

b. Identify *concave* and *convex polygons*.
c. Identify the center, *radius, diameter,* and *circumference* of a circle.
d. Identify the number of *faces, edges,* and *vertices* of *prisms and pyramids*.

Objective 2: Specify locations and describe spatial relationships using coordinate geometry.
a. Graph points defined by ordered pairs in all four *quadrants*.
b. Write the ordered pair for a point in any quadrant.

Objective 3: Visualize and identify geometric shapes after applying transformations.
a. *Turn (rotate)* a shape around a fixed point and identify the location of the new vertices.
b. *Slide (translate)* a polygon either horizontally or vertically on a coordinate grid and identify the location of the new vertices.
c. *Flip (reflect)* a shape across either the x- or y-axis and identify the location of the new vertices.

Standard 4: Students will understand and apply measurement tools and techniques.

Objective 1: Identify and describe measurable attributes of objects and units of measurement.
a. Compare a meter to a yard, a liter to a quart, and a kilometer to a mile.
b. Identify *pi* as the ratio of the *circumference* to *diameter* of a circle.
c. Explain how the size of the unit used in measuring affects the precision.
d. Estimate length, volume, weight, and area using *metric* and *customary* units.

Objective 2: Determine measurements using appropriate tools and formulas.
a. Measure length to the nearest one-sixteenth of an inch and to the nearest millimeter.
b. Estimate and measure an angle to the nearest degree.
c. Calculate the *circumference* of a circle using a given formula.
d. Calculate *elapsed time* across a.m. and p.m. time periods.
e. Calculate the *areas* of triangles, rectangles, and *parallelograms* using given formulas.
f. Calculate the *surface area* and *volume* of right, rectangular prisms using given formulas.

Standard 5: Students will collect, analyze, and draw conclusions from data and apply basic concepts of probability.

Objective 1: Design investigations to reach conclusions using statistical methods to make inferences based on data.
a. Design investigations to answer questions by collecting and organizing data in a variety of ways (e.g., bar graphs, line graphs, frequency tables, stem and leaf plots).
b. Collect, compare, and display data using an appropriate format (i.e., bar graphs, line graphs, *line plots*, circle graphs, scatter plots).
c. Compare two similar sets of data on the same graph and compare two graphs representing the same set of data.
d. Recognize that changing the scale influences the appearance of a display of data.
e. Develop and evaluate inferences and predictions based on data.

Objective 2: Apply basic concepts of probability.

a. Write the results of a probability experiment as a fraction, ratio, or percent between zero and one.
b. Compare experimental results with anticipated results (e.g., experimental: 7 out of 10 tails; whereas, anticipated 5 out of 10 tails).
c. Compare individual, small group, and large group results for a probability experiment.